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Epoxy resin for paints— Specification

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Contents

Page

1 Scope 1

2 Normative references 1

3 Terms and definitions 1

4 Requirements 5

5 Packaging and marking 7

Annex A (informative) Method of determination of epoxide equivalent of epoxy compounds 8

Foreword

Rwanda Standardsarepreparedby Technical Committees and approved by Rwanda Standards Board (RSB) Board of Directors in accordance with the procedures of RSB, in compliance with Annex 3 of the WTO/TBT agreement on the preparation, adoption and application of standards.

The main task of technical committees is to prepare national standards. Final Draft Rwanda Standards adopted by Technical committees are ratified by members of RSB Board of Directors for publication and gazettment as Rwanda Standards.

DRS300 was prepared by Technical Committee RSB/TC 024, *Chemical and consumer products*.

In the preparation of this standard, reference was made to the following standards:

1) IS 14925: 2001, Epoxy resin for paints — Specification

2) IS 1303: 2001, Glossary of terms relating to paints

The assistance derived from the above source is hereby acknowledged with thanks.

Committee membership

The following organizations were represented on the Technical Committee on Chemicals and consumer products (RSB/TC 024) in the preparation of this standard.

Amaco Paints Company Ltd

AMEKI COLORS Ltd

Crown Paints Rwanda Ltd

Institute of Agriculture, Technology and Education of Kibungo (INATEK)

Integrated Polytechnic Regional Center — Kicukiro Campus (IPRC — Kicukiro Campus)

Ministry of Health (MINISANTE)

National Industrial Research and Development Agency (NIRDA)

Rwanda Environment Management Authority (REMA)

Rwanda Plastic Industries (RPI)

Shalom Paints Ltd

SIGMA PAINTS

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University of Rwanda — College of Education (UR — CE)

University of Rwanda (UR) — College of Science and Technology (UR — CST)

Rwanda Standards Board(RSB) – Secretariat

Epoxy resin for paints — Specification

1 Scope

This Rwanda Standard prescribes the requirements and methods of sampling and test for epoxy resin used in paint industry.

2 Normative references

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ASTM A775M/A775M – 07b (2014),*Standard Specification for Epoxy-Coated Steel Reinforcing Bars*

ASTM A934/A934M – 13,*Standard Specification for Epoxy-Coated Prefabricated Steel Reinforcing Bars*

ISO 3673-1: 1996, *Plastics — Epoxy resins — Part 1: Designation*

ISO 7142: 2007, *Binders for paints and varnishes — Epoxy resins — General methods of test*

3 Terms and definitions

For the purposes of this standard, the following terms and definitions apply.

3.1

paint

pigmented material, which when applied in a liquid form to a surface, forms after a time a dry adherent film. The following main types are recognized:

a) oil paint - paint that contains drying oil or oil varnish as the basic vehicle ingredient;
b) water paint (emulsion paint) - paint that contains a water emulsion or dispersion as the vehicle; and
c) paste paint - paint in which the pigment is sufficiently concentrated to permit a substantial reduction with vehicle before use.

3.2

epoxy resin

synthetic resin containing epoxide groups and in which a final polymer is formed as a result of reaction taking place substantially at the epoxide groups

3.3

ambient temperature

temperature between 21ºC and 38 ºC

3.4

ageing

change, if any, occurring in a coating on standing under defined conditions at or near ambient temperature

3.5

epoxide equivalent

mass of an epoxide compound, in grams, which contains one mole of epoxide group

3.6

rust

coating of red or yellow oxides of iron produced when iron and steel is exposed to a humid atmosphere. Not to be confused with 'White Rust' which is a term loosely used to describe corrosion products of certain non-ferrous metals

3.7

acid resistance

resistance of paint, enamel or varnish film to acids. The term is of little value, unless it is referred to a standard of performance under, specified conditions

3.8

latex paint

paint based on pigment emulsion of synthetic resin

3.9

adhesion

degree of attachment between a paint or varnish film and the underlying material which may be another film of paint or any other material, such as wood, metal, plaster, among others.

3.10

anti-condensation paint

paint designed to minimize the effects of condensation of moisture under intermittently dry and humid conditions. Such a material normally has a matt textured finish and frequently contains cork or some other heat insulating materials as a filler

3.11

anti corrosive

general term used to describe material used for preventing corrosion

3.12

synthetic paint

paints based on synthetic resin

3.13

barrier coat

coating used to isolate a paint system from the surface to which it is applied in order to prevent chemical or physical interaction between them, to prevent the paint solvent attacking the underlying paint or to prevent bleeding from underlying paint or material

3.14

binder

non-volatile portion of the 'Vehicle' of a paint. It binds or cements the pigment particles together and the paint film as a whole to the material to which it is applied

3.15

bitty

description applied to a paint or varnish containing bits of skin, gel, flocculated material or foreign particles, which project above the surface when the paint or varnish is applied in a manner appropriate to its type and purpose. The term 'Peppery' is sometimes used when the bits are small and uniformly distributed. The term 'Seedy' specifically denotes bits which have developed in a paint or varnish during storage

3.16

bituminous paints

paints based essentially on bituminous ingredients

3.17

chalking

phenomenon manifested in paint film by the presence of loose removable powder, evolved from the film itself at or just beneath the surface. Chalking may be detected by rubbing the film with the finger tip or other means

3.18

checking

phenomenon manifested in paint film by slight breaks in the film that do not penetrate to the underlined surface. Different types of checking are given below:

a) irregular pattern type - Checking in which the breaks develop in the surface of the film in no definite pattern.

b) line type - Checking in which the breaks in the surface of the film are generally arranged in parallel lines, usually either horizontally or vertically over the surface of the film. These breaks often follow the line of the brush marks.

c) crow-foot type - checking in which the breaks in the surface of the film form in definite three prong pattern with the breaks running from a centre and forming an angle of 120ºbetween the prongs

3.19

coat

paint, varnish or lacquer applied to a surface in a single application to form a properly distributed film when dry. A paint system usually consists of a number of coats separately applied in a predetermined order at suitable intervals to allow for drying. It is possible with certain types of material, to build-up paint systems ofadequate thickness and opacity by a more or less continuous process of application, namely wet on wet spraying. In this case no part of the system can be defined as a separate coat in the above sense. Followingtypes are recognized:

a) full coat, as thick a coat of paint, varnish or lacquer as can be applied in one operation (brush or spray) consistent with the production of a film of uniform appearance, satisfactory hardness, etc, when dry;

b) glaze coal - translucent or semi-transparent coating, sometimes coloured. It may be either an intermediate or the final coat of a paint system. It is frequently applied thinly with the object to modify but not obscure the ground colour;

c) ground coat - coat of paint having good opacity which is applied before a glaze coat or stumble. The final colour effect when glazed is dependent on the mutual influence of the ground coat and the glaze coat;

d) guide coat - very thin coat of loosely bound paint applied over a continuous coating of surface or filler, prior to rubbing down. It is completely removed during the rubbing operations but, as it first disappears from the higher spots and ridges, it serves as a guide to the -operator in producing a smooth surface; and

e) mist coat - It can be of two types:

i) very thin coat applied by spraying, more particularly in connection with cellulose lacquers. In some cases it may form a 'fogged' coat or non-continuous film; and

ii)) thin coat of volatile thinners, with or without a small amount of lacquer, which is sometimes sprayed over a dry lacquer film to improve the smoothness and lustre.

a) round coat - full coat of a heavy bodied paint or varnish.

b) sharp coat -- coat of white lead in oil thinned liberally with turpentine or white spirit. A sharp coat used for treating new plaster following the trowel is frequently referred to as 'sharp colour'.

3.20

coating

liquid, liquefiable for mastic composition, that is converted to a solid protective, decorative or functional adherent film after application as a thin layer

3.21

colour

aspect of the appearance of objects which depends up-on the spectral composition of light reaching the retina of the eye and upon its temporal and spatial distribution

4 Requirements

4.1 General requirements

4.1.1 A condensation product of epichlorohydrin and bisphenol A in alkaline condition, which leads to formation of epoxy group containing resins. These resins shall have different molecular weight or epoxy equivalent weight depending on stoechiometric ratios of above mentioned reactants. The manufacturer shall declare molecular distribution and average molecular weight.

4.2.2 Depending upon the applications in paint system epoxy resins can be classified into three types based on average molecular weight or epoxy equivalent weight when determined through the method specified in Annex A, along with physical state of resin.

Table 1 — Physical state of resin

Types	Physical state	Average molecular weight	Epoxy equivalent weight	Test method
Type A	Liquid	360-380	180-200	
Type B	Low molecular weight, solid			
Grade 1		900	425-550	

Grade 2		1400	850-1000	Annex A
Type C	High molecular weight, solid			
Grade 1		2900	1700-2300	
Grade 2		3750	2400-3500	

4.2 Specific requirements

4.1 Epoxyresin shall comply with the requirements specified in Table 2.

4.2 Keeping properties

The material when stored in normal storage condition at the ambient temperature shall retain its property for at least 12 months from the date of manufacture as prescribed in Table 2.

Table 2 — Requirement for epoxy resins

S/N	Characteristics	Type A	Type B		Type C		Test method
			Grade 1	Grade 2	Grade 1	Grade 2	
1	Colour (on 'Gardner' scale), Max	3	4	4	4	6	**4.2.1**
2	Viscosity						**4.2.2**
	a As such at 25° ±0.05°C (cps)	8000-15000	**A.1.1.1.1** -	**A.1.1.1.2** -	**A.1.1.1.3** -	**A.1.1.1.4** -	**4.2.3**
	b 40% in butyl carbitol at 25 ±0.5°C (cps)	-	80-170	470-750	1600-3400	4000-11000	**4.2.4**
	c 50% in 1:1 Mixture of O.Xylene/D.A.A at 25 ±0.5°C (cps)	-	100-150	-	-	-	**4.2.5**
3	Softening point (ball and ring	-	60-70°C	90-100°C	117-127°C	130-145°C	**4.2.6**
4	Epoxide equivalent g/mole	180-200	425-550	850-1000	1700-2300	2400-3500	
5	Hydrolyzable chlorine content by mass, Max	0.5	0.2	0.2	0.2	0.2	
6	Relative density (at 27ºC ±l 2ºC)	1.15-1.20	-	-	-	-	ISO 7142

5 Packaging and marking

5.1 Packaging

The material shall be packaged in sound, clean and dry containers as agreed to between the manufacturer and the purchaser.

5.2 Marking

The containers shall be marked with the following information:

a) name and type of the material;

b) type and grade;

c) mass of the material;

d) month and year of manufacture;

e) batch No. or lot No. in code or otherwise; and

f) name of the manufacture and/or any recognized trade-mark.

Annex A
(informative)

Method of determination of epoxide equivalent of epoxy compounds

A.1 Principle

A.1.1 Method A

Epoxide groups react with nascent hydrogen bromide produced by the action of a standard 0.1 mol/1solution of perchioric acid on tetraethyl ammonium bromide. The end-point is determined either by using crystal violet as indicator or, for dark-coloured products, by a potentiometric method. This method is recommended for normal reactive epoxy resin.

A.1.2 Method B

The amino nitrogen of the epoxyamine is titrated with a standard solution of perchloric acid. The value thus obtained is used as a correction in the calculation of the epoxide equivalent as obtained in Method A. Thismethod is recommended for slow reactive epoxy resin.

NOTE — Safety goggles and safety screen maybe used while carrying out tests through the above methods.

A.2 Reagents

A.2.1 Acetic Acid, Glacial

A.2.2 Acetic Anhydride

A.2.3 Suitable Solvent for Solution of the Sample —for example, chloroform, dibutyl phthalate, chlorobenzene

A.2.4 Potassium Hydrogen Phthalate — Dry the potassium hydrogen phthalate for 2 h at 120°C before use.

A.2.5 Crystal Violet, Indicator Solution — Dissolve 100 mg of crystal violet in 100 ml of acetic acid.

A.2.6 Perchloric Acid, 0.1 mol/1 Standard Solution — To 8.5 mL ofa 70 % (m/m) aqueous solution of perchloric acid, add 300 mL of acetic acid followed by 20 mL of acetic anhydride. Dilute to 1 L with acetic acid and mix thoroughly, Standardize this solution by titrating it against 200 mg of potassium hydrogen phthalate dissolved in 50 mL of acetic acid, using the crystal violet indicator solution (see Note 1).

A.2.7 Use 4 to 6 drops of the crystal violet indicator solution and continue the titration until a stable green colour is obtained. Note the temperature, t_s, of the solution of perch loric acid at the time of standardization (see Note 2). The concentration, C, in mol/1 of the standard perchloric acid solution, is given by the formula:

Bibliography

[1] *IS 354: 1987, Methods of sampling and test for resins for paints: part 4, Special test methods for epoxy resins*

[2] IS 1070: 1992, Reagent Grade Water-- Specification (Third Revision)

DRS 300: 2016

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